

Text-figs. 1-6.—Inner ventral views of tarsi III (left) and tarsi IV (right) of female *Cyto-stethum*. 1 and 2, *C. promeces*; 3 and 4, *C. trachypyx*; 5 and 6, *C. charactum*.

Text-figs. 7-9.—Dorsal views of female *Cytostethum*. 7, *C. charactum*; 8, *C. trachypyx*; 9, *C. promeces*.

Text-figs. 10 and 11.—Ventral views of male *Cytostethum*. 10, *C. promeces*; 11, *C. charactum*.

present. Coxal apodemes of coxae III and IV as in nymph of *C. promeces*. Otherwise legs and tarsi similar to female.

CYTOSTETHUM PSEUDOCARACTUM, n. sp.

Types: Holotype female and one paratype female in Queensland Institute of Medical Research, and one paratype female in South Australian Museum.

Female.

Dorsum (Text-fig. 19). A fairly stout species, length 850μ , breadth 348μ , very similar dorsally to *C. charactum*. About nine annulations between second and third dorsal shields, with transverse row of four setae. Third dorsal shield with eroded anterior edge, posteriorly with two lateral lobes as in *C. charactum*, but medially convex and deeper; with ten paired setae. End of hysterosoma heavily sclerotized.

Venter (Text-fig. 20) with about twelve complete striations. Pair of small setae on sclerotized lobes between coxae IV.

Tarsi III and IV (Text-figs. 14 and 15). Setae B and D rather short and not notched as in *C. charactum*; setae A and C fairly slender. Tarsus III with small, apical, sclerotized point.

CYTOSTETHUM NANOPHYES, n. sp. (νανόφυης, dwarfish).

Types: Holotype female and one paratype female in Queensland Institute of Medical Research. Also three female and five male paratypes in South Australian Museum, taken from same host, Tasmania, March, 1947.

Female.

Dorsum (Text-fig. 21). A small, slender species, length 584μ , breadth 156μ . First dorsal shield slightly concave anteriorly, and very slightly convex posteriorly, separated from second by narrow furrow, with a seta at each edge. Second dorsal shield similar in shape to first, but larger. With about six annulations and a transverse row of four setae between second and third shields. Third dorsal shield oval, without distinct margin, or entirely absent in one specimen, being replaced by transverse cuticular annulations. Posterior of body with pointed lobe.

Venter (Text-fig. 22). The specimens with the third dorsal plate present also have a sclerotized median plate behind coxae IV, with margin indistinct, and merging into annulations which run forward. This plate is absent in the specimen without a third dorsal shield. A sclerotized strip between coxae IV, with two small setae. Three specimens, including the one without a third dorsal shield, bear a single, elongate ovum, 203 to 234μ long, 47 to 62μ wide.

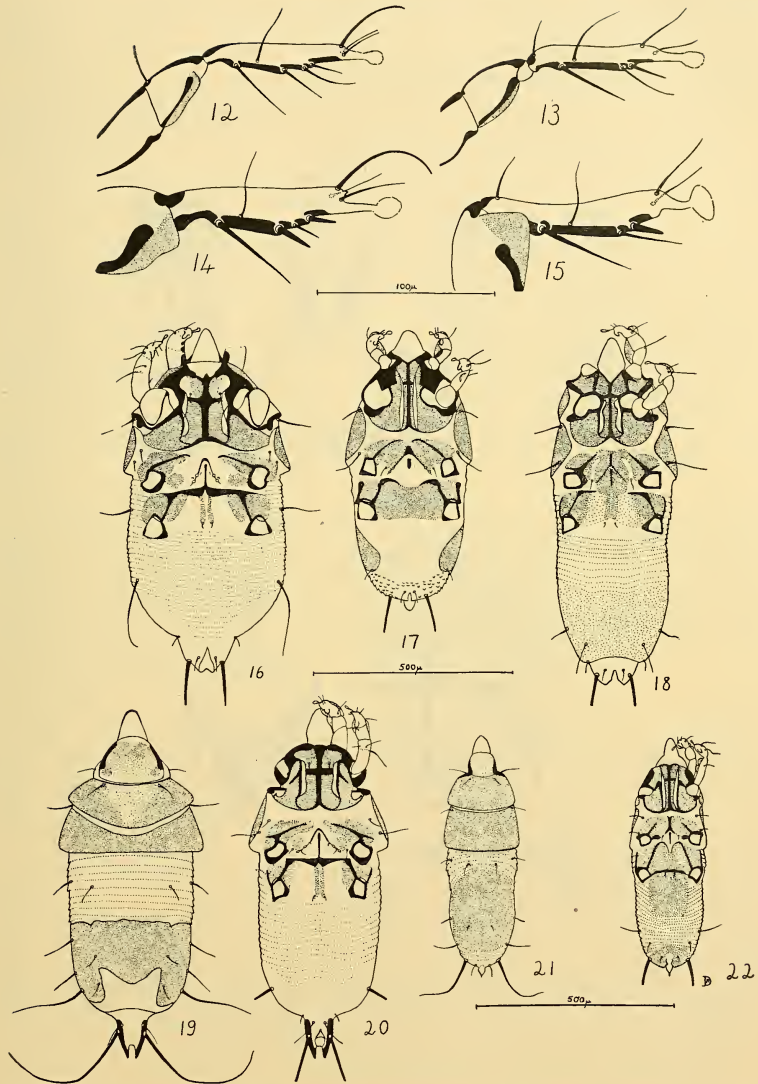
Tarsi III and IV (Text-figs. 12 and 13) with all setae, including B and D, long and slender.

Male.

Dorsum. Slightly stouter, but smaller than female, 436μ long. Anterior part of body as in female. Third dorsal shield reaching edge of hysterosoma and more heavily sclerotized than in female.

Venter (Text-figs. 29 and 30). Genitalia placed between coxae IV, flanked by two distally-expanded processes, which are attached to lobes of the sclerotization between coxal apodemes IV. These organs are possibly used as claspers, or to guide the intro-mittent organ. Anal area without suckers, and provided with four strongly sclerotized processes and two setae. Apex of hysterosoma transparent marginally, and with twelve paired setae, including one pair of very long ones. Beneath the cuticle between coxae III are six or seven spherical, translucent bodies of unknown nature.

Legs III and IV (Text-figs. 29 and 30). Legs III normal, with coxae III covered by sclerotized flap, apodemes of coxae III not meeting medially. (The flap over coxae III is not as prominent in the other four species.) Legs IV swollen and stumpy, apodemes of coxae IV meeting medially in cruciform sclerotization. Area around apodemes completely sclerotized and punctate. Penultimate segment of leg IV provided with stout inner spine almost as long as tarsus IV. Tarsus IV heavily sclerotized, with five



Text-figs. 12-15.—Inner ventral views of tarsi III (left) and tarsi IV (right) of female *Cyrtostethum*. 12 and 13, *C. nanophyes*; 14 and 15, *C. pseudocharactum*.

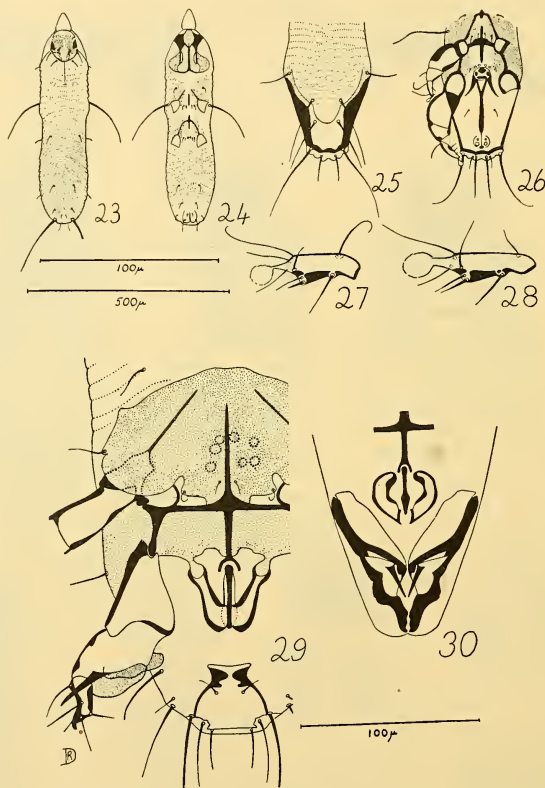
Text-figs. 16-18.—Ventral views of female *Cyrtostethum*. 16, *C. charactum*; 17, *C. trachypyx*; 18, *C. promeces*.

Text-figs. 19-22.—Dorsal (left) and ventral (right) views of female *Cyrtostethum*. 19 and 20, *C. pseudocharactum*; 21 and 22, *C. nanophyes*.

setae, and stout apical point. Caruncles not seen on tarsi IV. Text-figure 29 was drawn from a very flattened specimen in which the leg structure was easily seen. In the other four male specimens, which are not flattened, legs IV are folded inward, the hooks of the tarsi meeting medially (see Text-fig. 30).

Distribution.

All five species are known from the type host and locality in S.E. Queensland, and *C. nanophyes* also from the same host, Tasmania.



Text-figs. 23-28.—Dorsal and ventral views of female nymph (left) and mature male (right), and inner ventral views of tarsi of *Campylochirus queenslandicus*. 23 and 24, female nymph; 25 and 26, mature male; 27 and 28, tarsi III and IV of female.

Text-figs. 29 and 30.—Ventral surface of male *Cytostethum nanophyes*. 29, large, flattened specimen; 30, normal specimen with legs IV folded.

CAMPYLOCHIRUS QUEENSLANDICUS (Womersley, 1943), n. comb.

Recently fresh material of this species collected from *Isodon obesulus* Shaw and Nodder (Flying Fish Point, N.Q., 22.iv.55, E. H. Derrick) has been seen. The type series has also been examined. Womersley's description and figures are incorrect in some respects, and the species is redescribed and refigured below. The dorsal shield in all stages is not uniformly sclerotized and punctate, and the four setae are actually off

the shield (Text-fig. 23). The inner surfaces of coxae I and II are definitely transversely striate.

Female adult.

Apart from the differences above, Womersley's figure and description are correct. The ovum is single, elongate-oval, with the capsule thickened and asymmetrical at the anterior end, 257μ long, 54.6μ wide.

Female nymph.

Dorsum (Text-fig. 23). A slender stage, varying in length from 468 to 480μ . With small antero-dorsal shield not sclerotized medially or at postero-lateral margins, and without setae, but with four setae just behind postero-lateral margins. Remainder of dorsum covered by cuticular annulations, which are more crowded posteriorly. Dorsum and sides of hysterosoma with twelve small, paired setae. End of hysterosoma with small triangular area without annulations, and with two long apical setae.

Venter (Text-fig. 24). With scale-like folds in cuticle and a short seta in front of coxae III and with long seta outside coxae III. Apodemes of coxae III not meeting medially; with four small setae between coxae III. Apodemes of coxae IV meeting in longitudinal sclerotized strut; with a pair of small suckers and two pairs of small setae between coxae IV. Annulations very irregular, with about ten paired setae.

Tarsi III and IV (Text-figs. 27 and 28) shorter and stouter than in *Cytostethum*, but of similar general build, with setae placed as shown. Tarsus III with extra apical seta.

Male nymph.

In both the type series and the series from Flying Fish Point, there are two forms with well developed male genitalia, which are identical apart from the heavier sclerotization and ornamentation of the posterior third of the dorsum of the hysterosoma. I feel that the 8-legged form described by Womersley is an unmodified male, his description being adequate apart from the characters noted above. The male form described below is fully mature, and with sexual modifications at the posterior end of the hysterosoma. Lawrence (1952) reported that a similar condition may occur in *Alabidocarpus* Ewing.

Male adult.

Dorsum (Text-fig. 25). Somewhat stouter than female, length 508 to 580μ . Anterior part of body as in female. Posteriorly, hysterosoma with rounded median lobe, which has no transverse annulations. The short striations at the edges of this lobe are longitudinal. With three pairs of long setae placed around the lobe as illustrated. Postero-lateral margins of hysterosoma sclerotized, with two long apical setae. Apex of body with transparent, six-lobed cuticular membrane, with four pairs of setae.

Venter (Text-fig. 26). Setae around coxae III as in female, but apodemes stronger, and meeting medially in short bar. Apodemes of coxae IV strong and curved, partly obscured by coxae III, and meeting in longitudinal strut; with four small suckers and two small setae between coxae IV. Genitalia placed between coxae IV, with four sclerotized structures in the aperture, and with four sclerotizations which run back from the aperture, the median two of which combine and run back to the level of the anus. One seta is present on either side of this median bar. Anus longitudinal, with two small suckers on each side, the anterior being the smaller. Postero-lateral margins of hysterosoma narrowly sclerotized.

Legs III and IV with tarsi rather similar to female, but tarsus III with small, inner, apical point. Other segments heavily sclerotized and swollen. (See Text-fig. 25.)

Acknowledgements.

I wish to thank Mr. H. Womersley for examining the specimens and confirming my belief that a new genus was needed. Mr. Hale has kindly allowed me to examine the type specimens of *Austrochirus queenslandicus* Wom., and *A. sminthopsis* Wom., and specimens of *Chirodiscoidea caviae*, and to describe the male of *Cytostethum nanophyes* from the South Australian Museum collection.

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ACARINA FROM FIVE HUNDRED NATIVE MAMMALS FROM QUEENSLAND.

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[Read 28th September, 1955.]

Synopsis.

Thirty-nine species of mites and six species of ticks are listed from 582 native mammals of seventeen species collected in Queensland. Earlier partial lists are corrected, and eighteen new hosts recorded. New synonymy: *Laelaps melomys* Womersley, 1937, equals *Laelaps rothschildi* Hirst, 1914.

This paper is an extension of the small, recently published list (Domrow, 1954) of the acarine parasites of the introduced rats, *Rattus rattus* and *R. norvegicus*, in Queensland. The data on the Acarina collected on 582 native mammals from Queensland are now given. These animals form two series, one examined at the Department of Health and Home Affairs, Brisbane, between October, 1937, and September, 1941, and the second at the Queensland Institute of Medical Research, Brisbane, from June, 1950, to December, 1954. The Health Department series has unfortunately been partly destroyed, but careful examination of what is left, and the original notes and correspondence, together with the intact Institute collection, have allowed the compilation of the following list. The Health Department material was prepared by Dr. E. H. Derrick and one of us, D.J.W.S., while the Institute series was collected by Dr. Derrick, Mr. J. H. Pope, and the other, R.D.

Four small lists, devoted almost exclusively to parasites of bandicoots, have been published. The first (*Annual Report on the Health and Medical Services of the State of Queensland for the year 1937-38*) gave fourteen records. These included eight from bandicoots, of which all are correct except *Schöngastia dasyceci* Hirst, which specimens were later considered (Womersley, *in litt.*, 5.x.38) to be a complex of two species, *Euschöngastia perameles* and *Guntherana kallipygos*. Both forms of Listrophoridae are considered to be *Campylochirus queenslandicus*, which was described from *Trichosurus vulpecula*, and is also common on the bandicoot. "*Laelaps* sp.n." was based on a preliminary identification (Womersley, *in litt.*, 17.vi.38) as "probably a new species of *Laelaps*". In a later letter (5.x.38) he regarded these specimens as more closely related to *Hypoaspis*. However the specimens are now lost; they may have been a new genus of Hypoaspidinae (Womersley, *in press*) from the same host, *Trichosurus vulpecula*. *Laelaps melomys* is a synonym of *L. rothschildi*, and is discussed under that species. The other three records are correct.

This first list formed the basis of the second (Derrick *et al.*, 1939) of nine species from bandicoots, of which the first five are correct. The other four were taken directly from Womersley, *in litt.*, 5.x.38. *Hypoaspis perameles* and *Neoschöngastia isoodon* were manuscript names of Womersley, and were listed without descriptions. They are therefore *nomina nuda*. *N. kallipygos* was a premature publication of the name under which Gunther (1939a) described the species. "Listrophoridae, species nova" is considered to be *C. queenslandicus*.

The third list of seven species from three native animals (*Sixth Annual Report of the Queensland Institute of Medical Research, 1951*) is correct.

The fourth list (Mackerras, Mackerras and Sandars, 1951) of seventeen species from the bandicoot was a compilation from earlier lists, but also included three species which were not taken in the present surveys, namely, *Ixodes feicalis* Warburton and Nuttall,

Trombicula deliensis Walch, and *T. minor* Berlese. However, the larva of *T. minor* is unknown, and this record may refer to *T. hirsti* Sambon (see Womersley, 1952, p. 83).

These four lists are referred to below as Lists A, B, C and D respectively.

DERMANYSSIDAE.

BDELLONYSSUS da Fonseca.

Bdellonyssus bursa (Berlese).—This species was taken only once, on a bandicoot; 10 ♀♀, Taringa, Brisbane, 7.x.50, E.H.D. See List C.

ECHINONYSSUS Hirst.

Echinonyssus validipes Domrow.—This species was described from *Potorous tridactylus*. See Domrow (1955a).

LAELAPTIDAE.

HYPOASPIS G. Canestrini.

Hypoaspis, sp.n. (Womersley, in press).—There is some doubt as to the correct host of this species, as it was found walking actively over the bodies of *Thylogale wilcoxi* and *Isodon obesulus*, which had been packed in the same bag.

HAEMOLAEALAPS Berlese.

Haemolaelaps marsupialis Berlese.—This species is common on bandicoots in S.E. Queensland, being taken on more than 40 of those examined. It is often present in large numbers, up to 80 specimens being taken on a single animal. The mites have a decided preference for the area around the hind-quarters, and are sometimes engorged with blood. There is a large preponderance of females over males, there being only two males in more than 90 specimens in the Institute collection. A large proportion of these females are gravid, bearing a single egg. This species was recorded under the ms name "*Hypoaspis perameles*" in List B (Womersley, in litt., 17.iii.55).

LAELAPS Koch.

Laelaps nuttalli Hirst.—This species was taken in number on eleven of eighteen *Rattus culmorum* from Benarkin, October, 1953. See List A for records from bandicoots. Two new host records are three *R. conatus*, Babinda, October, 1954, and *Melomys littoralis*, Innisfail, 18.iii. and 12.iv.54. It would seem that this cosmopolitan species, like *Notoedres muris*, is moving onto the native fauna.

Laelaps rothschildi Hirst.—This species was previously recorded (List A) as *L. melomys* Womersley, 1937. On close examination, the two syntypes and more than twenty other named specimens in the South Australian Museum, Adelaide, were found to be identical with *L. rothschildi* Hirst, 1914, and *L. melomys* is here placed as a synonym of that species. Womersley (in litt., 13.iv.55) agrees with this finding. Dr. G. Owen Evans of the British Museum has examined the type specimen of *L. rothschildi* for us, and says this "agrees very well with the figure given by Hirst (1914). The 'sternal shield' is a compound structure comprising a moderately sclerotised sternal shield bordered by a strongly sclerotised endopodal shield". This is the case in the syntypes of *L. melomys*, and Womersley's figure of the sternal shield is not quite exact. The syntypes of *L. melomys* also have heavier sclerotizations between coxae IV similar to those shown in the figure of *L. rothschildi*. A large series recently collected from *Melomys littoralis*, the type host of *L. melomys*, also agrees exactly with *L. rothschildi*.

Numerous specimens, Innisfail, 12.x.38, and 56 ♀♀, Babinda and Innisfail, March to April, 1954, from *Melomys littoralis*; in numbers from 20 to 50 on *M. cervinipes*, Mackay, 22.vi.38, and Imbil, 19.viii.38; also numerous specimens on three *R. assimilis*, Imbil, 6. and 19.viii.38.

Laelaps sminthopsis Wom.—This species, only recorded from *Sminthopsis leucopus* from Victoria, has been taken on *Antechinus flavipes*, 13 ♀♀, Mt. Glorious, 6.viii.51. See Womersley (1954a).

Laelaps sp.n. Womersley, in press.—Taken in numbers up to 28 on two of three *R. assimilis*, Mt. Glorious, 6.viii.51, and Mt. Nebo, 3.x.53.

HETEROLAEALAPS Hirst.

Heterolaelaps antipodanus Hirst.—This species, recorded (List A) from Woombye, 26.i.38, was also taken in small numbers from a third bandicoot, Nambour, 21.vii.38. It has not been met with since.

MESOLAEALAPS Hirst.

Mesolaelaps anomalus Hirst.—This species was originally recorded from New Guinea. Specimens have been taken in the present survey on two bandicoots in North Queensland, 5 ♀♀, Mossman, 2. and 3.iii.54. Smears from red specimens of this species made by Dr. E. H. Derrick showed blood cells.

Mesolaelaps australiensis Hirst.—See Lists A, B and D for records of this species from bandicoots.

In the paper containing the two new species listed above (Womersley, in press), there is also a new genus and species of Laelaptidae from the bandicoot from Institute material.

IXODIDAE.

IXODES Latreille.

Ixodes fecialis Warburton and Nuttall.—This rather rare species is recorded in List C from *Antechinus flavipes*, 2 ♀♀, 1 larva, Dalveen, 27.vi.51. Also one specimen from *R. assimilis*, Mt. Glorious, 6.viii.51, and 2 ♀♀ on *R. culmorum*, Benarkin, 21.x.53.

Ixodes holocyclus Neumann.—Apart from bandicoots, which are favoured hosts, this species was taken on *Antechinus flavipes*, Mt. Glorious, 6.viii.51, on four *Trichosurus vulpecula*, Nambour, 9.vi.-5.vii.38, and on *R. assimilis*, Mt. Glorious, 3.ix.54. See all four lists, and Smith (1942).

Ixodes tasmani Neumann.—This species is also common on bandicoots. Two specimens were also taken on *R. assimilis*, Mt. Glorious, 6.viii.51. See List C.

HAEMAPHYSALIS Koch.

Haemaphysalis bancrofti Nutt. and Warb.—Four specimens from *Trichosurus vulpecula*, Nambour, 2.vii.38. See List A.

Haemaphysalis humerosa Warb. and Nutt.—The biology and material of this species are fully discussed by Smith (1941). It has not been as common in the later Institute series. Additional localities from *Isodon obesulus* are Camp Mt., S.E.Q., 5.x.53, Mossman, 20.ii.-3.iii.54, and Mirriwinni and Flying Fish Point, N.Q., November, 1954.

Haemaphysalis spinigera var. *novae-guineae* Hirst.—See List A. Nine specimens from three bandicoots, Nambour district, 10.i. to 28.ii.38.

SPELEOGNATHIDAE.

BOYDATA Womersley.

Boydaiia derricki Wom.—This probably accidental record from *R. assimilis* is discussed by Womersley (1954b). Only a single specimen is known.

TROMBICULIDAE.

TROMBICULA Berlese.

Trombicula antechinus Wom. and *Trombicula thylogale* Wom.—Both these species were described from Institute material by Womersley (1954c). The former species has also been taken on *R. assimilis*, Mt. Glorious, 6.viii.51.

EUSCHÖNGASTIA Ewing.

Euschöngastia antipodiana (Hirst).—This species was described from *Rattus greyi*, Kangaroo Is., S. Aust. About sixteen larvae have also been taken from *Antechinus flavipes*, Cooloolabin, 10 and 12.i.38. See List A.

Euschöngastia cairnsensis (Womersley and Heaslip).—Apart from the original records, further specimens have also been taken in the ears of two *R. assimilis*, Mt. Glorious, 6.viii.51 and Mt. Nebo, 9.x.50, and on the perineal region of bandicoots.

Euschöngastia derricki (Wom.).—Womersley (1952) only recorded the original Health Department material, but further specimens have been taken on one of the type hosts, *R. assimilis*, Mt. Glorious, 6.viii.51.

Euschöngastia hirsti (Wom. and Heas.).—Described from *Melomys cervinipes*. No further specimens have been taken.

Euschöngastia innisfailensis (Wom. and Heas.).—A new host record for this species is *Isoodon obesulus*, Innisfail, 1.x.54, eighteen larvae on perineum.

Euschöngastia perameles (Wom.).—This species was also described from Health Department material, and has since been taken on twelve of the bandicoots examined at the Institute. It is the commonest trombiculid species so far encountered on native mammals in S.E. Queensland. The specimens listed as *Schöngastia dasycerci* Hirst in List A are really a mixture of this species and *G. kallipygos*. Despite its name, this species has never been recorded from the genus *Perameles*. Womersley originally intended to call it *Neoschöngastia isoodon*, but, owing to the premature publication of that name in list B, he described it as *N. perameles* after another genus of bandicoots (1939, p. 160).

Euschöngastia phascogale (Wom. and Heas.).—Apart from the original records, this species has also been taken on *Isoodon obesulus*, Brisbane, 3.viii.51.

Euschöngastia popei Wom.—This species was described from Institute material (Womersley, 1954c).

Euschöngastia queenslandica (Wom.).—See Womersley (1939) for material from rodents. This species was also present on twelve of the bandicoots of the Health Department series, Cowan Cowan, Moreton Is., April to August, 1939. A further locality from *R. assimilis* is Mt. Nebo, 3. and 9.x.53. These latter specimens were in the ears of the host.

Euschöngastia rattus (Wom. and Heas.).—Ten specimens have been taken on the type host, *R. assimilis*, Mt. Glorious, 6.viii.51.

Euschöngastia smithi (Wom.).—Only known from the type series from *R. assimilis*, collected by Health Department.

Euschöngastia trichosuri (Wom.).—Described from *Trichosurus vulpecula* from Health Department material. No further specimen has been taken.

Euschöngastia wongabelensis (Wom.).—Two larvae from *R. assimilis*, Mt. Glorious, 6.viii.51.

GUNTHERANA Wom. and Heas.

Guntherana kallipygos (Gunther).—The records of Womersley (1939) from Queensland are from Health Department material. Further specimens were taken from bandicoots in the Institute series. Numerous ova were taken attached to the hairs of one bandicoot, Mt. Nebo, 16.iv.53. These were in all stages of development, and similar to those figured by Gunther (1939b), a fully developed larva being visible in several. See note on *S. dasycerci* under *E. perameles*.

LEEUVENHOEKIIDAE.

ACOMATACARUS Ewing.

Acomatacarus sp.—A species of this genus occurs rarely on bandicoots in S.E. Queensland. Two specimens are in the Institute collection, Indooroopilly, Brisbane, 20.ix.51, and Mt. Nebo, 16.iv.53. See Derrick and Womersley (1954). However the specimens are not in good condition, and we hesitate to name them specifically.

ACARIDAE.

ACARUS Linnaeus.

Acarus siro L.—Numerous males and females from vicinity of pouch of bandicoot, Brisbane, 4.ix.50. This bandicoot had been in captivity for several months, and was moribund on examination, when the mites were found. This species is normally not a parasite.

SARCOPTIDAE.

NOTOEDRES Railliet.

Notoedres muris (Mégnin).—A further host record for this cosmopolitan species, which, like *L. nuttalli*, also seems to be moving onto the native fauna, is *R. culmorum*, Eidsvold, 10.viii.51, and Benarkin, October, 1953. In the three rats with this parasite the infested part was a scurfy area around the base of the tail and on the back.